CLAIMS

1. An apparatus for reducing the liquid content of a material comprising a particulate/liquid mixture, the apparatus comprising containment means to contain the material, and means to apply pressure to the contained material therein, the containment means being partly defined by at least one first sheet member comprising a first filtration membrane permeable to the liquid but impermeable to at least some and more preferably substantially all of the solids contained within the material, wherein the filtration membrane comprises a textile or other synthetic material having at least one conductive element in integral association with at least a part thereof so as to constitute where so associated a composite first electrode; and being further partly defined by at least one second sheet member comprising a second filtration membrane permeable to the liquid but impermeable to at least some and more preferably substantially all of the solids contained within the material when the filtration membrane comprises a textile or other synthetic material having at least one conductive element in integral association with at least a part thereof so as to constitute where so associated a composite second electrode; the first and second electrodes being remotely spaced from each other in contact with the material to allow application of a potential difference across the material.

2. An apparatus according to claim 1 wherein the means to apply pressure acts to urge the first and second sheet members into closer association with each other, reducing the distance between them so as to apply hydraulic pressure to the material to be dewatered.

3. An apparatus according to any preceding claim configured as a belt filter press wherein at least one of the belts is a first filtration membrane and at least one of the belts is a second filtration membrane in accordance with any preceding claim integrally associated with a conductor so as to function respectively as a first/second electrode for at least a part of the length thereof.

4. An apparatus according to claim 3 configured such that the containment means defines a conduit with an input for material to be dewatered, an output for dewatered material, a means to apply pressure therealong, a first belt member comprising a filtration membrane substantially along the length thereof, the filtration membrane being associated with a conductor for at least a part of the length thereof to form a first electrode, and a second belt member spaced apart from the first belt member to retain material to be dewatered therebetween, the belt member being associated with a conductor for at least a part of the length thereof to form a second electrode such as to allow an application of potential difference across a material to be dewatered within the conduit.

5. An apparatus according to one of claims 3 or 4 wherein the means to apply pressure along the conduit acts to urge the belts towards each other to induce a hydraulic pressure in the material to be dewatered therebetween, and is so arranged that this pressure is increased as the material passes along the conduit.

6. An apparatus according to one of claims 3 to 5 wherein each belt is disposed as a continuous belt around a plurality of pressure rollers and/or guide rollers, each roller being an insulator at least on a contact surface thereof.

7. An apparatus according to one of claims 3 to 6 wherein the edges of each belt are provided with an insulating surface coating to permit the edges of opposing belts to touch without creating a short circuit.

8. An apparatus according to one of claims 3 to 7 wherein the belt is a woven belt, the conducting elements comprise an array of weft elements disposed generally transversely to the belt, and additional transfer elements are located generally toward one of both edges of the belt and extending longitudinally therealong, incorporated into the warp so as to be in electrical contact with the weft elements, but woven in such manner as to be partly exposed on the surface of the belt.

9. An apparatus according to any preceding claim wherein the filtration membrane is a sheet material having a primarily non-conductive polymeric base structure, being woven, knitted, needle-punched, non-woven or otherwise fabricated, and including conducting elements within or on the sheet structure in intimate association.

10. An apparatus according to claim 9 wherein the conducting elements are elongate conducting elements comprising thread, tape, wire or the like

11. An apparatus according to claim 10 wherein the sheet structure is woven or knitted and the elongate conducting elements are woven or knitted into the sheet.

12. An apparatus according to one of claims 9 to 11 wherein the conducting elements constituting at least one of the electrode sheets disposed as an anode in use comprise metallic elements coated in mixed metal oxide.

13. An apparatus according to any one of claims 1 to 8 wherein the filter membrane comprises an inherently conducting material.

14. An apparatus according to claim 13 wherein the filter membrane comprises polymeric material loaded with carbon.

15. An apparatus according to any preceding claim wherein the filtration membrane comprises a plurality of discrete conductive regions.

16. A method of removal of liquid from a material comprising a mixture of solid particles and liquid the method comprising the steps of:
containing the material within a containment means, which containment means is at least partially defined by at least one first sheet member comprising a first filtration membrane permeable to the liquid in the material but impermeable to at least some, and preferably substantially all, of the solid components of the sludge slurry or tailings, the filtration membrane comprising a filtration material having at least one conductive element in integral association with at least a part thereof to serve as a first electrode; and is further partly defined by at least one second sheet member comprising a second filtration membrane permeable to the liquid but impermeable to at least some and more preferably substantially all of the solids contained within the material when the filtration membrane comprises a textile or other synthetic material having at least one conductive element in integral association with at least a part thereof so as to constitute where so associated a second electrode;
applying pressure to the material to induce hydraulic drainage through the filtration membrane;
applying a potential difference between the first and second electrodes to induce electro-osmotic drainage through the filtration membrane.

17. A method according to claim 16 wherein the potential difference is applied across a controlled area of the material only, by applying a power source to only a part of the conductive area or to one or a few of a plurality of discrete conductive zones on the filtration membranes.

18. A method according to claim 16 or 17 comprising a continuous belt process, wherein the containment means is provided as a conduit with an input for material to be dewatered having full liquid content and an output for material to be dewatered where the liquid content has been reduced and a means to apply pressure there along;
The method comprising feeding material to be dewatered into the input, causing the material to travel therealong, applying pressure and potential difference thereacross to reduce the liquid content by simultaneous application of hydraulic and electro-osmotic drainage effects, and removing the sludge slurry or tailings at the output.

19. A method according to one of claims 16 to 18 applied to the treatment of sludge, slurries, mineral wastes, slimes, muds, dredgings or tailings by dewatering.

20. A method of modifying a conventional hydraulic pressure dewatering apparatus comprises incorporating a conductive filter membrane as an in situ, retrofitted modification.